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BOSTON SOCIETY OF CIVIL ENGINEERS
FOUNDED 1848

PROCEEDINGS

PAPER IN THIS NUMBER.

"The Engineer in the Tropics." T. Howard Barnes.

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Contributors are hereby notified that proof will not be submitted to them for examination unless requested before the 10th of the month preceding the month of publication.

MINUTES OF MEETINGS.

BOSTON, April 26, 1922.—An adjourned meeting of the Boston Society of Civil Engineers was held this evening in Gilbert Hall, Tremont Temple. The meeting was called to order at 7.45 P.M., by the President, Dugald C. Jackson. This meeting was a joint meeting of the Boston Society of Civil Engineers and the Northeastern Section of the American Society of Civil Engineers.

There were 75 members and guests present.

The reading of the minutes of the Annual Meeting was dispensed with since they are printed in the April JOURNAL.

The Secretary reported for the Board of Government the names of those elected to membership in the grades named:

Members — Messrs. Harold F. Davis,* Albert C. Dove, Harrison P. Eddy, Jr.*, and Charles L. Crosier.*

* Indicates transfer from grade of Junior to Member.

Juniors — Messrs. Ovidio D. Chiesa and Frederick J. Randlett.

Associates — Messrs. William A. Connolly and James R. Gibson.

The President announced the death of the following members:

Mr. William Nelson, who died March 13, 1922,

Mr. Will B. Howe, who died April 1, 1922,

Mr. Andrew M. Lovis, who died April 25, 1922.

It was voted that the President appoint Committees to prepare memoirs of these members. The Committee appointed for William Nelson consists of Messrs. C. A. French and Prof. C. Frank Allen. The Committee for Will B. Howe consists of Messrs. W. H. G. Mann and F. W. Lang. The Committee for Andrew M. Lovis consists of Messrs. Arthur W. Dean and John R. Rablin.

The President announced that under authority of a vote of the Society the following committees had been appointed:

On Approving Applications for Membership: The Secretary, the two Vice-Presidents, and in case of the absence of any one of these three, the Treasurer to act as alternate.

On Investment: The President, the Senior Vice-President and the Treasurer.

On Publication: Harold K. Barrows, Chairman, Edgar S. Dorr and Henry B. Wood.

On Papers and Program: Dugald C. Jackson, Chairman, John B. Babcock, 3d, Herbert N. Cheney, Herbert S. Cleverdon, Richard K. Hale, Frank M. Gunby, J. H. Manning and Frank A. Marston.

On the Library: J. B. Babcock, Chairman, Dwight Porter and Edward H. Cameron.

On Social Activities: Erwin Harsch, Chairman, Frank L. Flood, Kenneth C. Reynolds, Howard C. Thomas and Walter A. Woods.

On Legislative Matters: Henry F. Bryant, Chairman, Hartley L. White, Charles B. Breed, Frank O. Whitney and Sturgis H. Thorndike.

On Licensing of Engineers: Edwin H. Rogers, Chairman, Charles T. Main, Charles W. Sherman, Irving E. Moulthrop and Charles M. Spofford.

On Run-Off: Arthur T. Safford, Chairman, Harold S. Boardman, Arthur C. Eaton, X. Henry Goodnough, Richard A. Hale, Charles H. Pierce, Walter H. Sawyer, Charles W. Sherman, William F. Uhl, Frank E. Winsor, Dana M. Wood and S. Stanley Kent.

On Sub-Soils of Boston: Harry E. Sawtell, Chairman, Henry S. Adams, Charles D. Kirkpatrick and Frank M. Gunby.

On Tinkham Memorial: Edward W. Howe, Chairman, Desmond FitzGerald, Edgar S. Dorr, Frederick H. Fay and John E. Carty.

On Membership: John E. L. Monaghan, Chairman, Arthur B. Appleton, George S. Coleman, Carl S. Ell, Frank C. Shepherd, Warren D. Trask, John P. Wentworth and Dana M. Wood.

On Welfare: Lewis E. Moore, Chairman, David A. Ambrose, Charles R. Berry, John E. Carty, Pusey Jones, Beardsley Lawrence and John F. Osborn.

Prof. Jackson introduced Mr. Frank B. Sanborn, Chairman of the Northeastern Section, American Society of Civil Engineers, who conducted the literary program.

It was voted by the members of the Northeastern Section that the next meeting of the Section would be held on Saturday, June 3, 1922, instead of having the regular May meeting.

The subject of the meeting was Universal Form of Contracts.

General William H. Rose, Director of Lockwood, Greene & Company and Manager of the New York Office, discussed the general principles involved in the Universal Form of Contract.

The following speakers were then introduced who discussed this subject:

Mr. Wm. Stanley Parker, F. A. I. A., Chairman of the American Institute of Architects Committee on Contracts, and Member of the Joint Conference on Standard Contract Forms, discussed the paper from the architect's viewpoint;

Mr. Arthur W. Dean, Chief Engineer, Division of Highways, Department of Public Works, Commonwealth of Massachusetts, spoke from experience in municipal and public works;

Mr. J. Parker Snow, Consulting Engineer, Boston, from the railroad point of view;

Col. Frank M. Gunby, Engineering Manager for Charles T. Main, Engineer, Boston, from an industrial engineer's viewpoint;

Mr. Arthur C. Tozzer, Vice-President and New England Manager of Turner Construction Company, from that of the contractors.

The subject was then informally discussed by the following: Prof. Charles M. Spofford, Prof. C. Frank Allen, Leonard C. Wason, Mr. Nelson of the firm of Jackson & Moreland and E. S. Larned. Concluding remarks were made by Mr. J. P. Snow, Mr. Parker and General Rose.

Upon the motion of Professor Allen a vote of thanks was tendered to those who participated in the meeting and who are not members of the Boston Society of Civil Engineers or of the Northeastern Section, American Society of Civil Engineers.

Adjourned at 10.20 P.M.

J. B. BABCOCK, *Secretary*.

BOSTON, April 12, 1922. — The regular April meeting of the Designers Section of the Boston Society of Civil Engineers was called to order at 6.10 P.M., by Chairman Arthur L. Shaw.

There were 24 members and guests present.

The minutes of the previous meeting were read and accepted.

Mr. John W. Raymond, Jr., of the staff of Metcalf & Eddy, gave a very interesting and complete talk on "Some Features of Sewer Design."

A short discussion followed.

Meeting adjourned at 7.20 P.M.

W. F. PIKE, *Clerk*.

BOSTON, March 10, 1922. — A regular meeting of the Northeastern College Section of the Boston Society of Civil Engineers was held this evening at the Society Rooms, Tremont Temple.

The meeting was called to order by the Chairman, Mr. Edwin C. Williams, at 7.50 P.M.

The minutes of the previous meeting were read and accepted.

Mr. Frank L. Flood explained and read in detail the Constitution and By-Laws of the Section, as formulated by the Executive Committee.

Motion was made and seconded that no dues other than those due to the Boston Society of Civil Engineers be assessed any member of the Section. The motion was passed.

Prof. Henry B. Alvord, of Northeastern College, gave an instructive talk on "The Relation between Plane Rectangular Coördinates and Geographic Positions."

Meeting adjourned.

KARL H. AIMO, *Clerk.*

APPLICATIONS FOR MEMBERSHIP.

[May 17, 1922.]

THE By-Laws provide that the Board of Government shall consider applications for membership with reference to the eligibility of each candidate for admission and shall determine the proper grade of membership to which he is entitled.

The Board must depend largely upon the members of the Society for the information which will enable it to arrive at a just conclusion. Every member is therefore urged to communicate promptly any facts in relation to the personal character or professional reputation and experience of the candidates which will assist the Board in its consideration. Communications relating to applicants are considered by the Board as strictly confidential.

The fact that applicants give the names of certain members as reference does not necessarily mean that such members endorse the candidate.

The Board of Government will not consider applications until the expiration of twenty (20) days from the date given.

HAGEMAN, HARRY ANDREW, Newton Hlds., Mass. (Age 45, b. Niagara Falls, N. Y.) Graduate of Niagara Falls High School in 1893, and of Cornell University in Mechanical Engineering in 1899. During the summer of 1895-96 and from 1897-98 he was draftsman and designer on hydro-electric work for Niagara Falls Power Co.; 1899-1901, designer and field representative on hydro-electric work at Trenton Falls, N. Y., with W. A. Brackenridge, Consulting Engineer; 1901-5 draftsman and inspector for Niagara Falls Power Co., and its allied companies; 1906-7 assistant hydraulic engineer, with I. P.

Morris Co., Philadelphia, Pa., turbine manufacturers; 1907-9 mechanical engineer for operating dept., Niagara Falls Power Co., Canadian Niagara Power Co., and Niagara Junction Railway Co.; 1910-14 in charge of hydraulic department with Stone & Webster at their Seattle, Wash., and Fresno, Cal., offices, on design of White River development, Snoqualmie Falls development, Big Creek and White Salmon development (advisory capacity); 1914-17 engineer, hydraulic division, Stone & Webster, Boston office; 1917-1921 mechanical engineer in charge of design and construction of plant, Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.; 1921 to date hydraulic engineer, Stone & Webster, Boston. Refers to W. N. Patten, C. R. Main, J. H. Manning J. F. Vaughan, D. M. Wood.

MCCANN, GEORGE F., Jersey City, N. J. (Age 24, b. Lowell, Mass.) Graduated from Villanova College, Villanova, Pa., with the degree of B.S. in civil engineering in 1920, since which time has been employed by Thomas Murray, Inc., as designing and constructing engineer on the construction of Hell Gate Station of the United Electric Light and Power Co. In this work he conducted preliminary surveys, located lines and apparatus, supervised pouring of concrete, and was designing in the field office; at present is computing final quantity estimate of material used in the construction of the station. Refers to W. E. Boyd, F. J. McCann, J. J. Meagher, W. D. Morrill.

LIST OF MEMBERS.

ADDITIONS.

GIBSON, JAMES R.,.....65 Long Wharf, Boston, Mass.

CHANGES OF ADDRESS.

BIGELOW, W. W.,..... 141 Milk St., Boston, Mass.
 BURRAGE, HENRY T.,..... 67 Nolan St., Stratford, Conn.
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 SMITH, SIDNEY,..... 75 Corey St., West Roxbury, Mass.
 THOMAS, HOWARD C.,..... 100 Floral St., Newton Hlds., Mass.
 TUPPER, FREDERICK E.,..... Presidents Lane, Quincy, Mass.
 WHITNEY, RALPH E.,..... 19 Hillside Rd., Newton Hlds., Mass.

DEATH.

LOVIS, ANDREW M.,..... April 25, 1922.

LIBRARY NOTES.

BOOK REVIEW.

ESSENTIALS IN THE THEORY OF FRAMED STRUCTURES: By Charles A. Ellis, A.B. Vice-President, The Strauss Bascule Bridge Co.; with American Bridge Company 1901-1908. Asst. Professor of Civil Engineering, University of Michigan 1908-1912. Designing engineer Dominion Bridge Company 1912-1914. Professor of Structural Engineering, University of Illinois 1914-1921. First edition. New York, McGraw-Hill Book Co. 330 pp. Figures and tables.

REVIEWED BY LEWIS E. MOORE.*

This is essentially a text book and differs from ordinary texts in that the author follows a different order. Instead of developing generalities and formulas and then making particular applications, he begins with illustrative examples, and reasons about them, and from them deduces the general principles.

The first part is devoted to the conditions of equilibrium of co-planar forces and afterwards these principles are applied to the determination of stresses in trusses and in beams.

In the material on roof trusses the lack of standard practices is pointed out and considerable attention is paid to the uncertainties involved in this type of construction. No attempt is made to give solutions which are any more accurate than the uncertainties involved in the solution warrant.

The method of influence lines is used extensively in finding maximum stresses.

The chapter on the deflection of beams uses almost wholly the so-called area-moment method, which is much more powerful than the elastic curve method and is also much simpler in its application.

No treatment of statically indeterminate structures is given other than the chapter on restrained, continuous and partially continuous beams.

The deflection of trusses is treated and also the case of the swing bridge.

The book is quite novel in its method of approach to the subject and is intended to develop a student's ability to think rather than to present facts or formulas to memorize. It should prove useful, especially to the experienced teacher.

* Consulting Engineer, 1149 Tremont Bldg., Boston, Mass.

RECENT ADDITIONS TO THE LIBRARY.

U. S. Government Reports.

Bulletin 983, U. S. Dept. of Agriculture.

Annual Report of the Weather Bureau. U. S. Dept. of Agriculture.

Municipal Reports.

Burlington, Vt. Annual Report Water Department, 1921.

Danvers, Mass. Annual Report Water Commissioners. 1921.

Holyoke, Mass. Board of Water Commissioners. 1921.

Laconia, N. H. Annual Report Public Works Department 1921.

Northampton, Mass. Annual Report Water Commissioners. 1921.

Plymouth, Mass. Annual Report Water Commissioners. 1921.

Springfield, Mass. Annual Report Water Commissioners. 1921.

Wellesley, Mass. Annual Report Water Commissioners. 1921.

State Reports.

Connecticut. Annual Report Department of Public Works. 1921.

Massachusetts. Annual Report Department of Public Works. 1920.

New Jersey. Annual Report Department of Conservation and Development. 1921.

Miscellaneous.

Engineering Index. 1921.

Overhead Systems. National Electric Light Association. Report.

Prime Movers. National Electric Light Association. Report.

Proceedings of Institution of Civil Engineers. Vol, 211. Part 1.

Report of Mines Branch, Canada. 1920.

LIBRARY COMMITTEE.

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PAPERS AND DISCUSSIONS

This Society is not responsible for any statement made or opinion expressed in its publications

THE ENGINEER IN THE TROPICS.

By T. HOWARD BARNES,* MEMBER BOSTON SOCIETY OF CIVIL ENGINEERS.

" Then go away if you have to go,
Then go away if you will,
To again return you will always yearn
While the lamp is burning still.
You've drunk the Chagres Water
And the mango eaten free,
And, strange though it seems, 'twill haunt your dreams,
This Land of the Cocoanut-Tree."

— JAMES STANLEY GILBERT.

THE pure luxury of stretching at ease, book in hand, enveloped by a breeze tempered at eighty degrees, is a sensation not peculiar to any one clime. To avail of such, however, some part of each day, in three hundred out of the year, is possible only in the Tropical belt.

That some such compensation is deserved for bearing with the 'tween time ills no one will deny. No description can be phrased improving upon Gilbert's, of the worries and the pests of those siren shores. Not in vain had this Kipling of the Isthmus made his home where insect and malaria alternate with trade wind and moonlight through the palms, and his ready pen has wonderfully pictured one's conflicting sensations. He knew what it was to have to drive sluggish labor by day as well as to enjoy conviviality on a cool veranda after sunset. He had seen

* Consulting Engineer, 17 Battery Place, New York, N. Y.

the dancing devils of a fever-stricken brain, likewise enjoyed the fun of a moonlight lobster hunt in the phosphorescent sea.

The newcomer frequently tells you very soon after arrival that he wants to get back home, things are different from what they were represented. However, he is under agreement to remain, as a usual thing, and remain he does, unless his temper is such as to make him useless to the enterprise, in which case he is shipped away and the loss is charged up to "contingencies."



FIG. 1. — "TO AGAIN RETURN YOU WILL ALWAYS YEARN."
NANCES CAY — ALMIRANTE BAY, PANAMA.

One might see him later, when the cold winds of December have arrived, and hear him tell of the wonderful days he left behind in the "Land of the Cocoanut Tree." He would like to go back, or thinks he would, and if he should go he would probably be better satisfied and perhaps make good. However, we don't take the risk. On the other hand, if our hero has sturdy blood and some resources within himself, he accepts the situation he finds himself in, works on, discovers that there are compensations, helps to finish up the job and then feels that he has earned a rest and a period of recreation. Then when such a one remembers the "Land of the Cocoanut Tree" he is fairly sure to go back when opportunity offers, a seasoned man who has made good, and commanding a salary of which he has proved himself worthy.

Tropics. — The tropics present many variations of climate due to elevation and rainfall distribution. One cannot imagine more equable June-like conditions than those prevailing along the cordillera of Central America. It is here that the capital cities are situated at elevations from 2 500 to 5 000 feet, where the temperature is seldom excessive. The seasons divide sharply here between wet and dry, this being the case thence down to the Pacific.

At sea level the temperatures rise higher and further meteorological phenomena caused by the sea are presented. On the Atlantic side of Central America combinations of Trade winds and land topography result in a chaotically distributed rainfall, without any well-marked dry season excepting in spots, or well back from the coast. In the West Indies and on the northern coast of South America, the above mentioned combinations are operative, being vitally affected by the direction of the coast line and the relation thereto of the mountain ranges. Here also seasonal divisions into wet and dry are quite sharp, and a rainfall varying from fifteen to one hundred and fifty inches or more is found. Where a distributed rainfall exists, it usually occasions a high humidity. Where such prevails one on arising at 5.30 is burdened with a damp cloth feeling and a temperature close to or at the perspiration point. One experiences quite the contrary sensation in the wet and dry season regions where the morning freshness is life-giving.

The physical benefit of this absence of humidity has its counterpart in a mental exhilaration which the mutations of the seasons bring about. I refer to the Spring awakening which follows the falling leaf of the dry season, so in contrast with the dead monotony of green jungle prevailing in the all-the-year-round damp regions.

Temperature vs. Tropical Construction. — Taken at its best, however, he figures ill who plans to conduct work in the Tropics along lines normal to the Temperate Zone.

Apart from the important phase of distance from base which adds to its complications, there are not only new people, new customs, new materials to utilize and conform to, but as well new prejudices, new diseases and new bugs — physical and psychological — to combat.

Roosevelt's account of his African trip pictures the great difference the hunter finds there, in contrast with Rocky Mountain conditions. In the latter, one rolls himself, clothes and all, in his blanket and falls asleep in the open, while under the dog star he must first divest himself of insect life and get under carefully drawn screens.



FIG. 2 — ONE WAY TO UTILIZE THE BURRO. — BUILDING VILLEROS DAM.
COVENAS, COLOMBIA.

The same vexations and annoyances which roll off the surface on the Polar side of the Tropics take root and grow within their limits. Real troubles take on gigantic proportions while imaginary ones become tangible. The nervous system becomes unwontedly active just as the perspiratory one does, until the equilibrium of the overworked wires is upset. Also, as if always a malign influence must prevail, the liver grows torpid through the assumption of its work by the perspiratory system, and the old world is "sicklied o'er" by a jaundiced hue.

Personnel. — In selecting one's personnel, especially the one, two or more men at the head, great care should be exercised. Only those who have had previous Tropical experience, and who have demonstrated tact and resourcefulness should be entrusted with the execution of construction work in these neurotic climes.

Moreover, the men in these chief positions must be those who can with their own hands show the untrained laborers how to do their work, "Point the road to Heaven and lead the way."

As to Families. — We have heard the question argued back and forth, formerly more than now, as to the advisability of allowing families of employees to accompany them on Tropical engagements. One may sit down and convince the person who knows nothing about it that it is absolutely unwise to allow any wife, and especially the wife and children, to accompany her husband to the lower countries. On the other hand, observation has taught that as usual there is a golden mean. For a man with his family is living under normal conditions, and is more likely to remain so, provided his helpmate is of the right sort. Being thus placed under normal conditions, he will help in keeping those around him so. With some family life existing in the settlement, social amenities are possible, affording a certain feminine atmosphere for those unaccompanied by their families and for the unattached youth, which wards off gross tendencies.

It has been left for the Britisher to teach us the lesson of making a home where we go. One who is entering Tropical life for the first time, to carry out any extensive operation, will find it profitable to visit some of the British possessions, Jamaica, Trinidad, Demerara, etc., to observe what an atmosphere can be produced by persistence in one's home habits. Every one is recommended to read Flandrau's "Viva Mexico," in this connection, especially that delightful chapter about the Trawnbeigh Family.

The writer remembers the wonderfully refreshing sight of a few years ago, following a period of some duration in localities where the white woman in the colony was more of a rarity, to witness the normalcy produced by sports and games like bowling, provided for the employees and their families on the Canal Zone. Sober thought has passed judgment that the sensible, sane, busy woman is a desirable acquisition to her husband and the colony. The woman is no worse a gossip than the man, nor as bad. She usually has not enough to do, hence the stipulation that she must be busy. It is reasonable to believe that if a clean-cut grass sward with a neat hedge of Tropical plants surrounding a dwelling

in the midst of an isolated banana, cane or chocolate farm, will produce a feeling of at-homeness, how much more will that feeling be increased with the house-wife and her little ones within view thereof.

Sanitation. — So much has been written on this theme as to seem to make it unnecessary, indeed presumptuous, to add anything here. It is easy to forget, however, and there is one point out of all the good advice regarding clearing, ditching,



FIG. 3 — VILLEROS DAM. SO FAR BUILT BY BURROS. COVENAS, COLOMBIA.

housing, screening, water-supply, diet, etc. I would like to emphasize; namely :— the ninety per cent. advantage and the ten per cent. cost of the benefit usually obtainable by ditching off surface waters and letting in the sun.

I recall one situation which at first looked impossible to deal with. The picture presented was a row of straggling structures on the beach, a sand bar thrown up by the waters of the bay. These houses were those of squatters, for the most part, with a few of the more pretentious ones located on regular lots. Back of the bar stretched acres of bush-covered flats, standing several inches deep in water at all times, the terra firma being mud, underlaid by sand at a depth of a few inches to ten feet. Mosquitoes were present in myriads, increased, of course, by the un-

regulated rain water receptacles standing about the dwelling, but for the most part bred in the swamp at the rear. The situation appeared really desperate but it took only a few hundred dollars for clearing off the bush and trees, a few hundred more to run simple ditches, with a small sum for burning up the trash at an opportune time when the rain had forgotten to fall. Between showers the sun dried up the remnant of standing water not carried to the ditches, and left the ground absorptive instead of saturated.

Of course the rain water receptacles were done away with and a simple water system was installed. The net result was the abolishment of the mosquitoes. It must be cautioned, in passing, that a transformation like this is not self-perpetuating, and this case was not an exception to the rule. Indifferent hands had charge for a while, but the work was at a later period taken over and properly and cheaply maintained, and remains to-day as a happy illustration of the soundness of the civil engineer's guiding rule of "directing the great sources of power in nature, for the use and benefit of man."

Labor.—The method of securing labor is one dependent very much upon the size of the job. Anything of great magnitude justifies a labor department, with various ramifications, including agents for enlisting the men, a construction force for housing, and a prosecution of welfare work after the men have been landed on the job. To the enterprises of smaller volume, and this is the usual one, serious questions are opened up. If one is at a distance from large cities, he is situated between good luck and ill; good, because he is free from the city worker, who, while more versatile than the countryman, is too likely to foment trouble; and ill, because the man from the sod, it may be from coffee farm, cane plantation, cattle pasture, or elsewhere, has not the advantage of any previous construction training.

We will assume, therefore, that our source of labor is the surrounding country. Some attraction or inducement must be offered. Probably an advance payment is requisite. In many countries this may be made in such legal form that the individual is obliged to work it out. Assuming that our intentions toward our labor are fair—and they must be or we should never start in—

we secure the best possible representative we can, a citizen of the country, to execute this important trust.

The creation of a village feeling must now be borne in mind. We provide proper housing, and the feeding facilities. The latter are dependent upon the habits of the people. Almost always, especially at the start, the allotment of a cook and helper for each group of — say — twenty-five men, works well.



FIG. 4 — NATIVE HOUSE BUILT WITHOUT NAILS. COLOMBIA.

Provision must also be made for family life. Some men will want to bring their women, and accommodations should be furnished so that they can. Early establishment of a Commissary store is imperative. This should be run for helping the labor supply and not for its direct profit from sales. Luxuries, if carried, may yield whatever profit one chooses to fix, but necessities of life should be cheap. A reputation for cheap living is to be desired. It soon spreads abroad, though not as rapidly as does a reputation for a contrary condition.

It is a mooted question about selling rum. The writer does not favor it and has the practice of some long-headed citizens of Latin-American countries to sustain him. If strong drink is obtainable at points within reach, I would always limit sales on the works to beer and wine, together with soft drinks.

Housing and Health. — Simple housing, maintenance of cleanliness and a surety of good food at a fixed price, are rules that apply to all help in the out-of-the-way place, where our engineer is likely to find himself. Gradations in all of these items, according to classes of help, are of course to be understood; but each and every class must be looked out for. My experience is that it pays to feed and to house well, sufficiently well to constitute an attraction. It is commonly found that existing conditions in the region round about are at a low standard, and one's instinctive feeling inclines him to set up a system as suggested above, which commends itself to common sense and is good business in the long run.

I could cite instances where the furnishing of slightly superior accommodations has proved to be the key to success in economically carrying out work that was very special. The advantage offered by these dwellings held the men and prevented an otherwise big turnover of help, which would have entailed very vexatious results in the continued breaking in of new labor.

A regime which stops short of coddling, while carrying out the above ideas of looking out for one's labor, is wise from all points of view. Frequently, also, the construction work is for an industrial establishment and the taking of rather extra pains in the personnel has its additional value in building up a supply for the operating force.

Housing and mess accommodations for the imported employees should be made flexible. The writer makes use of a type of house which is adapted for housekeeping, and at the same time available for single men. It is thus possible to house a maximum number of employees at the start with a minimum of effort being diverted to this branch of the work.

Also it will usually be found that a general mess run at a fixed price by the company is advisable. Resources which later are at hand to permit individual housekeeping and real homes to be formed are too much lacking for that purpose at first.

It may be interesting here to mention one or two details of the headquarter houses which the writer observes in their construction. First, elevation of the floor seven or more feet above the ground, so as to permit utilizing the space below for laundry.

rough storage, playing, drying clothes, etc. Second, admission of air to rooms from two sides. Third, provision of a sitting veranda rendered practically rain proof by wall construction up to height of window sills and by wide overhang of roof. The same, or even less money, sometimes spent for an open veranda on three or four sides of the house will afford more satisfaction in securing one such sitting veranda on which furniture may remain at all times without damage. Of course, in some few

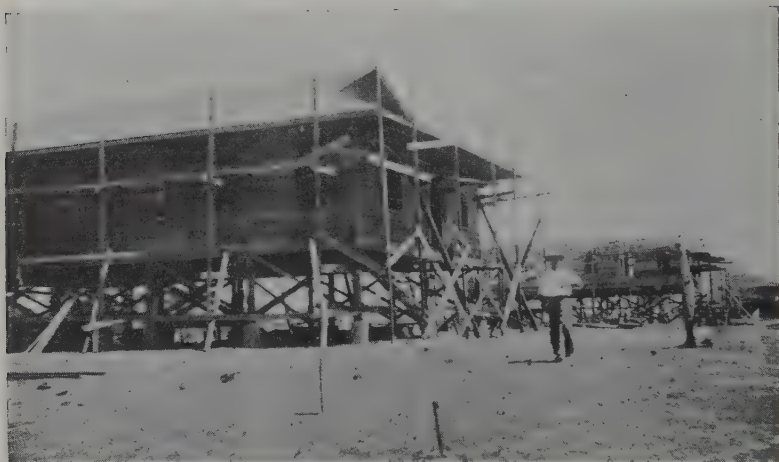


FIG. 5 — TYPE OF HEADQUARTERS HOUSE ADAPTED FOR BACHELORS OR FAMILY. ANT PROOF BASE—ELEVATED FLOOR—WIDE EAVES. COVENAS, COLOMBIA.

localities high winds will cause any veranda to become for the time useless. Indeed, such winds may entail the installing of glazed sash instead of simple blinds or jalousies generally sufficing. I am, of course, assuming that the screening of all outside openings is admitted as necessary.

A wholesome dread should prevail of any reputation for unhealthfulness attaching to the enterprise. Circumstances may arise through carelessness, or ignorance, or out of a clear sky, which plant the seeds of panic in the minds of employees, especially the white imported ones. The writer was a close-by observer of the near-panic on the Canal Zone in 1905, caused by the outbreak and continuance of yellow fever. He has also seen

elsewhere the morale of this class of employees badly shattered by the injudicious magnifying of the danger of infection of filaria.

As to the labor within the country, they also fight shy of an enterprise labelled with a reputation for feeding poorly, or having sickly surroundings. We may plan our very best, with reasonable housing, food, medical care, etc., and then find some influence, very likely unmerited, is working against us.

Another phase of the attitude of the country labor must often be reckoned with. It is its conception of what Hospitals are for. We are surprised to find that they think of a Hospital as a place to die in. Yet some of us, not so old, remember when going to the Hospital was equivalent in our minds to taking a last chance instead of our present conception of the Hospital as being our first hope and natural recourse.

The early accession of a good doctor is a necessity. He can give the common labor treatment right from the start, and gain their confidence in him and in his institutions. They are patient and appreciative of medical attention, and through this ever ready ministration are gradually brought to feel what a Hospital is really for. Then as to the imported employees, the doctor stands ready to say "Pooh" to a whim, and to afford proper service for real ills.

Making the Most of Labor. — Every effort should be bent to engage the labor on task work. They are accustomed to this, they enjoy working by fits and starts, and ordinarily lay off for a whole day during the week, with a half one every now and then. Their usual day consists of getting out at sunrise, swinging a machete until mid-day, or later, returning to their shelter and swinging in the hammock, enjoying the ministration of whatever feminine hand holds sway for the rest of the day.

It most often happens that a tasking of the labor cannot be arranged. In this case it will be found all the more valuable to do as much machine work as possible. If their attention is taken up by following the regular sound of a machine, especially if by diligence the pace may be slackened up for the last half hour of the day, they forget in the meantime their own troubles and save your nerves.

The wise foreman will avail of the above and of all possible means to secure a return from the untrained labor. Granted that the latter has strength, that he has come to work, fortified by something more than a drink of water sweetened by country sugar ("panela" or "dulce") then demands upon him for performance can be hopefully made, backed up by frequent reminder, and at times that powerful weapon, namely, sarcasm, which is far more effective than invective and leaves the boss the master of the situation. Failing all these, the imposition of a fine for absolute disregard for duty is a method often necessary to adopt, and one received in a strangely submissive way when it is really merited.

Materials. — The maintenance of a flow of materials in proper order and well in advance of necessity is imperative. Not only does the economy of construction depend on this in a direct way, but, as well, such economy is affected in an unlooked for indirect way. This is no less than an avoidance of a letting down in the morale, which, strange as it may seem, actually happens when repeated failures in the arrival of materials take place. It is actually true that any conscientious superintendent having his work all laid out by schedule becomes convinced that the base of supplies is being manipulated in a perfectly rotten way; no one is thinking of him and his work, otherwise why don't "they" send along materials. Then on top of it all, along comes a consignment of materials consisting of roofing, when columns are what he is looking for. It needs a patient character, one reasonable and with sufficient imagination to bear in mind the numberless causes for delays at the home port not to become misanthropic. This being the case, how diligent should the home office be to "keep the home fires burning."

Correspondence. — All correspondence should be conducted with a thought of the assistance and encouragement which it will be. Reports in proper form tell the history of construction as it goes along, but a weekly letter back and forth between the home office and the job is also needed to supplement this information. In all this the home office should observe super care to avoid any criticism in the least undeserved, sometimes even forgetting that which may seem merited.

Overhead. — The high cost of overhead will surprise anyone undertaking for the first time this long-distance work. This should not stagger one, however, for if the labor is untrained but rightly handled, even though the number of foremen, engineers, timekeepers, etc., needed to make the best use of this working force mounts up to a high proportion of the total payroll, it will be found that a less proportion so applied will reduce the effectiveness of the laboring body, and prove to be poor economy.



FIG. 6 — THE JOB NEARLY DONE. LA UNION WHARF, EL SALVADOR, C. A. M.

When one has been accustomed to carry in mind four or six per cent. as about the right proportion of overhead to labor cost, it comes as a surprise, in fact almost consternation, to be confronted with the large figures which will be found under circumstances with which we are dealing. In other words, overhead cost bears no true relation to the question of good or bad management in itself; and in most cases in the writer's experience, the cheapest construction has been accompanied by a very high overhead percentage. There could be cited one case where the percentage was above twenty, based upon the sum of both labor and material, with a resulting total cost which was perfectly satisfactory.

Courage Pills. — Doses for physical ills are a requisite. I have not gone into details of the necessary medical service, not that it should go unnoticed, but because I have considered it outside of the province of the layman and that sufficient had been published on this topic. Still, at the risk of entering into one detail of dosing in which doctors have disagreed, I am going to make a venture. This will be in the safe method, however, that of quoting someone else.

I refer to the dosing of quinine for avoiding or mitigating malarial infection. Two authorities from observation points a thousand miles apart, each in latitude ten degrees north, have vouchsafed as their judgment based upon many years' experience, that the most effective dose, where mosquitoes are prevalent and may not be eradicated, is from fifteen to twenty-five grains given once a week to each and every inhabitant. One of these medicos went so far as to affirm that, given autocratic authority, he would undertake to eradicate malaria over a country wide area by this means.

However, another kind of dosing is what I wish to call attention to. Proper letter-writing has been mentioned as one of the means of maintaining the courage of the distant personnel. And here let me strongly caution against the permitting of any auditor, either in the home office or the local one, to assume directly or by implication, by letter-writing or otherwise, the management or other executive functions in relation to the work. This is far from meaning that proper accounting should not be had, or that the maintaining of an independence between the accounting department and that of the construction should not be preserved. Neither does it mean that there is any reason why they should not work coöperatively for the good of the company. For, be it remembered, that the useful man, whether constructor or accountant, is he who at all times is loyal to the corporation or individual who is paying him his salary; and he has no right to put personal affairs above corporate ones. He must at all times judge his actions along the straight line maxim of doing what is best for his employer, or as usually stated "being a corporation man."

Granted that proper letters are doing their legitimate service, it must further be remembered that neither these nor any other means will substitute the effect which is to be had by the personal



FIG. 7—FIGHTING THE JUNGLE. LEADING WATER TO PUERTO BARRIOS, GUATEMALA.

contact of home representative with the foreign personnel. The penalty for conducting either construction work or business at a long range entailed by a tropical location, is that visits may not be made at frequent intervals by the responsible head from the home office. This getting onto the job face to face with the fine fellows doing company work is nothing less than inspiring.

The long hours of the few men who lead the way, their overcoming of difficulties and their all-around balance are features to be appreciated only by being seen. If these qualities are non-existent then there should be a change in the personnel. At the same time the effect on the home office is just as productive of sanity as it is upon the organization at the other end.

Opportunities. — We are often asked what the opportunities are for employment in — well, generally the question ends in, "down where you go," or, "in South America." Distance always lends enchantment, and usually to the questioner there exists a mistiness as to advantages or their absence. The writer cannot relate from experience anything concerning those thriving, populous countries of South America, south of the Tropics, nor indeed of the Tropical Belt south of British Guiana. However, it may be understood as applying to these regions as well as to those farther north, that the engineer seeking employment should secure a position before starting. If he arrives on the scene without commission, seeking a job, he is put down as a tramp, and seldom wears off fully the first impression he gives.

In what has been stated hitherto, it is plain that the desirable engineer, and the one most likely to make good, will be the one with the most experience. His eyes have generally been opened to knowing that there is more than one way to accomplish a given thing. He is therefore inclined to look about for adjustment to local conditions and adapt means to ends. It must be remembered that we always have something to learn in construction matters from the people we find ourselves among.

In his environment of fresh viewpoints, unexpected opportunities for new application of materials and ideas arise. Distance from usual supplies inclined him to resort to the use of local ones in novel ways and justifies him in so doing. Difficulties in local transportation as well as freight cost lead up to innovations in construction. In these our engineer must fall back on his good judgment, not forgetting to call in his assistants for council. Herein lies his strength in undertaking the novel in construction, that those helping in the execution shall feel that the project is in part their own.

The same cautions hereinbefore expressed for maintaining the morale of the organization, apply also to the one in charge locally, as between him and his working force. Only one who is magnanimous with his own aids can hope to make complete success.

In these times when strong organizations are looking outside for opportunities for construction work, and when business and



FIG. 8—A PLACE TO GET WELL IN. THE QUIRIGUA HOSPITAL, GUATEMALA.

development concerns are evolving projects in which engineering design and construction form part, the engineer will find his best alliance to be in some such connection.

General. — It should be remembered for the consolation of any candidate for the Tropics that one cannot make over human nature, nor can he change the habits of the people. However gratifying it would be to play the reformer, one must be satisfied with something less than the ideal, be at times a little blind. So good an authority as Ben Franklin in speaking of personal character has told us that a benevolent gentleman will permit a few faults in himself so as to keep his friends in countenance. I think on the whole there are very few of us who have insufficient faults to prevent being forgiving in dealing with the people among

which we may be thrown. Too many Americans (United States citizens, I mean) forget that it is not for their health that they go to a foreign country but for greater reward in money, for adventure, perhaps, but in any case they were not invited to go there by the people of those countries, hence any display of superiority whether by word or by look must be studiously avoided. It is easy to speak the word "Greaser" or "Spiggoty," but don't do it, and what is more don't think it. The same qualities of frankness and sincerity which commend a person to children are what carry one through everywhere, and the Tropical world is not an exception to this.

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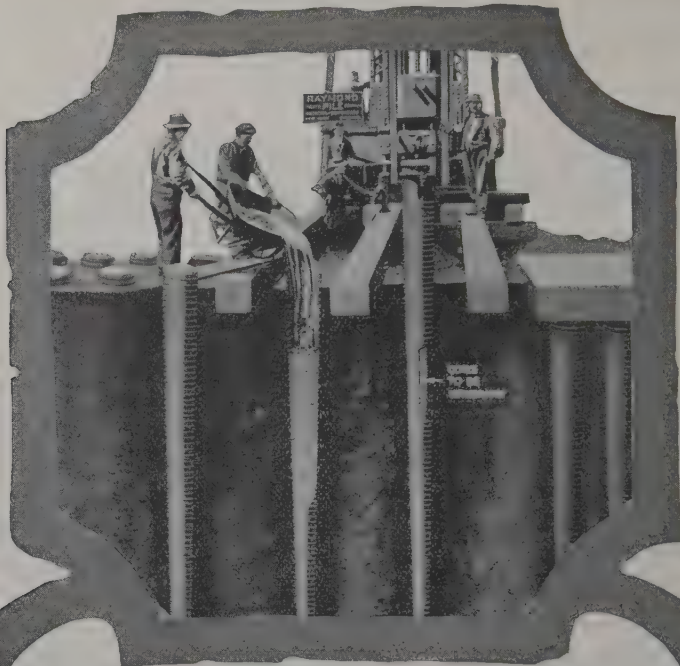
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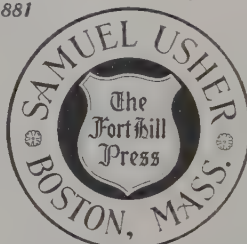
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